

Engineering Team-Work Aids Rush Army Job at Camp Upton, N. Y.



Constructing Quartermaster and All of His Division Heads at Yaphank Cantonment Formerly Worked Together in Same Organization—Barracks Sides Built Flat and Raised to Place

By ROBERT K. TOMLIN, JR.

Managing Editor, "Engineering News-Record"

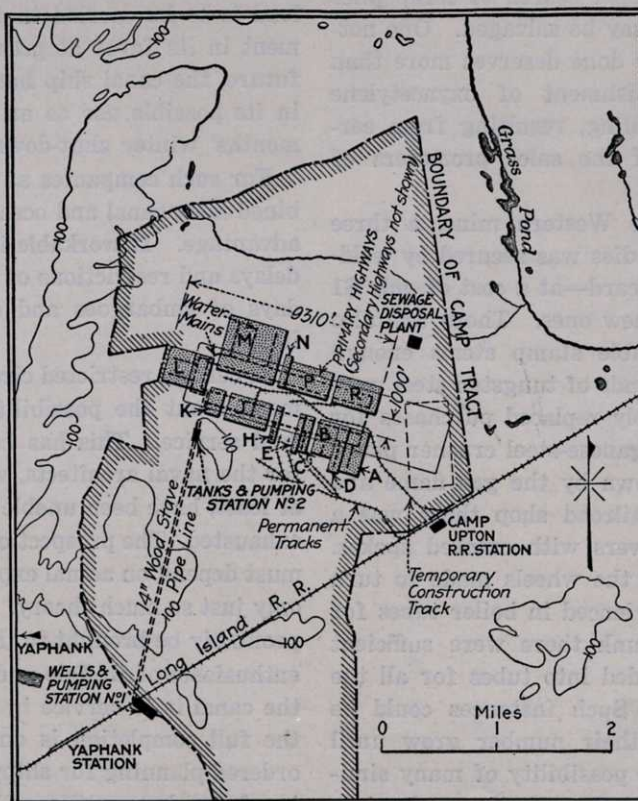
FOR Official Washington to put Yaphank, Long Island, "on the map" by naming it as the site for Camp Upton, one of the sixteen great cantonment cities for the National Army, was an extremely easy problem compared with that of putting this territory on the map, literally—a job upon which engineering and contracting forces, operating under the direction of the Quartermaster Department

of the U. S. Army, have been engaged since the contract was signed June 25. These men are at work filling the stupendous order of producing a complete city for 40,000 inhabitants in only a few months' time, and they had practically nothing to start with except an 11,000-acre tract of land so densely covered with underbrush, scrub oak and pine, as to prevent the running of even the roughest sort of survey line until advance parties had chopped sighting lanes through the thick foliage. In fact, local conditions have really created two big jobs at Camp Upton—the first, getting ready to build; the second, actual building. When I visited the camp early this month the preliminary stage of the great construction project had been about com-

pleted; the first permanent wooden barracks structure was put under roof Aug. 3, although a number of smaller temporary structures had been completed previously.

HOW WORK IS ORGANIZED

The organization of the engineering staff was the first task which confronted Major O'K. Myers; an engineer selected from civil life as Constructing Quartermaster to have supreme charge of the camp work. Prior to his entry into the Government service, Major Myers had seen extensive duty on New York City's Catskill Aqueduct, where the friends he made stood him in good stead in organizing the camp work. He arrived at Camp Upton—then a camp in name only—at 8 a. m., June 21, spent the day inspecting the site, and returned to New York that night to recruit an engineering staff capable of laying out and supervising construction operations involving the expenditure of several million dollars in only a few months' time. The fact that the first unit of the Catskill water system was completed recently was a fortunate one for the camp work on Long Island, for



OWING TO FLATNESS OF SITE IT WAS POSSIBLE TO GROUP BUILDINGS ACCORDING TO WAR DEPARTMENT'S STANDARD PLAN

it made available the services of experienced men from an organization which had won a national reputation for the excellence of its engineering personnel.

FIVE SUBDIVISIONS OF WORK

Major Myers' preliminary analysis of the construction problem indicated that it could be departmentalized under five main subdivisions, as follows: Executive, including inspection and valuation of materials and plant; buildings; sewers and sewage treatment; water supply; roads and surveys. A round-up of Major Myers' acquaintances produced men qualified by training and experience to assume at once charge of each department of the skeleton organization. D. W. Howes was chosen as the Constructing Quartermaster's deputy and given the title "Engineer of Construction." It is noteworthy that every department head has, at some time or other, been engaged in the Catskill Aqueduct construction. The accompanying chart shows the general scheme of organization.

With these men as a nucleus, the subordinate positions were quickly filled. The rush character of the work made it out of the question to go through the usual time-consuming process of civil-service examination. A man is hired on authorization from the Constructing Quartermaster. The camp work is not a training school for young engineers, and if a man cannot jump right into the work assigned him he is replaced by someone who can.

The important thing about the engineering organization at Camp Upton is its smooth-running quality—re-

markable in a brand-new machine. The resulting teamwork, however, is due to the fact that all of the department heads had worked together on the Aqueduct, and were schooled in a single system of administration and office and field routine.

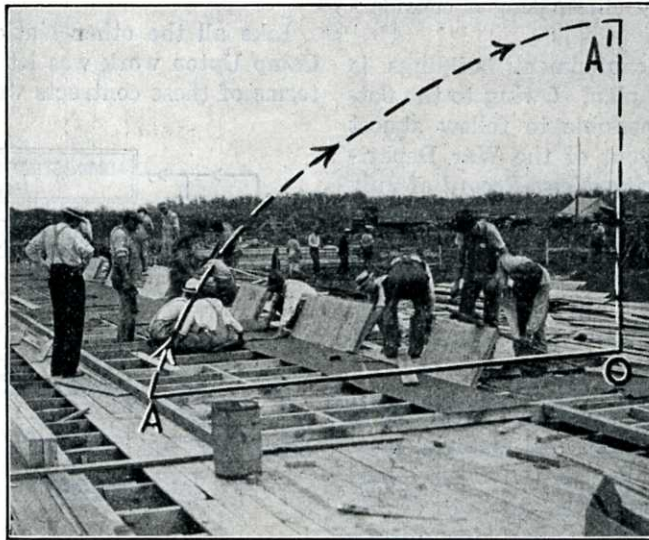
In addition to his regular staff, the Constructing Quartermaster is authorized to employ other engineers in consulting capacities. As the diagram shows, he receives the benefit of the advice of experts on water-supply and sewerage, heating, electric lighting, and roads.

The site of Camp Upton is along the backbone of Long Island, about 60 miles distant from the Pennsylvania R.R. terminal in New York City. It is about two miles north of the single-track line of the Long Island R.R., and is a comparatively flat area covered with a dense undergrowth of scrub oak and pine, which has made the work of preparing a topographical survey an extremely difficult and tedious task. The only

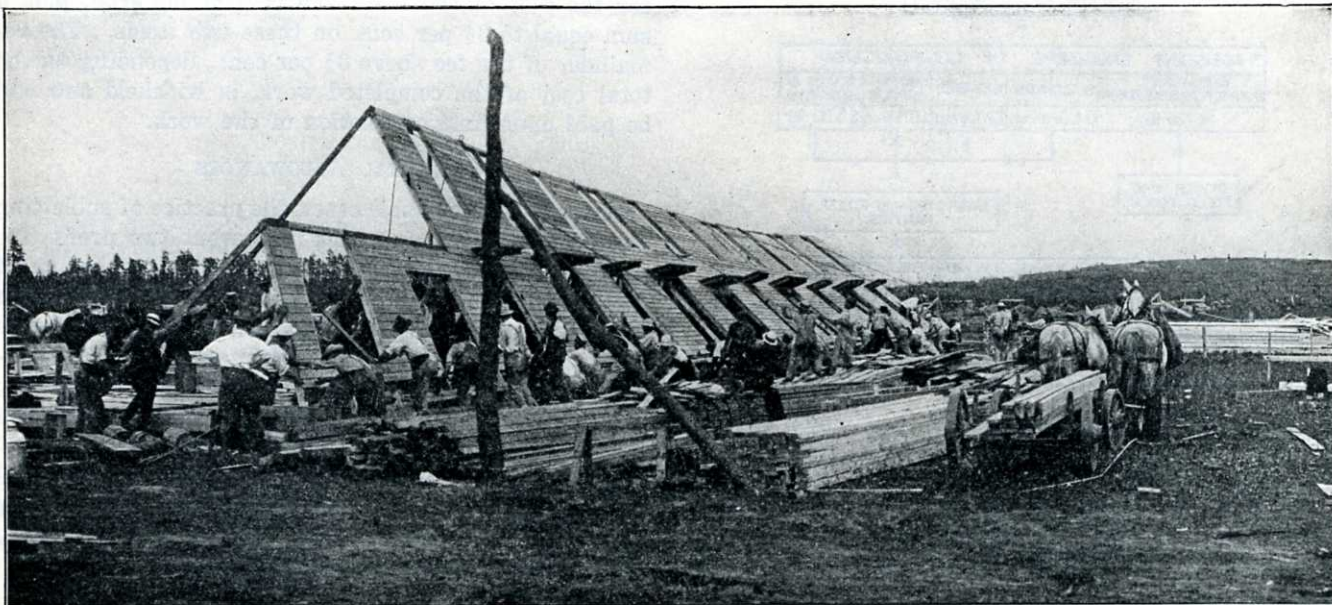
map of the territory available was one of the standard sheets of the U. S. Geological Survey, on which the 20-ft. contour intervals were not close enough to be of much practical value in arriving at a detailed location of the vast wooden city.

TOPOGRAPHICAL MAP THE FIRST NEED

Before work could be planned, therefore, it was necessary to secure a large-scale topographical map, and on June 23 the first field party, recruited in New York, had set out with equipment to secure the desired information. The general method of procedure was to mark up the area in 500-ft. squares, chop sighting lines



SIDES OF BARRACKS ARE FRAMED AND SHEATHED WHILE LYING FLAT ON FINISHED FLOOR AND THEN—



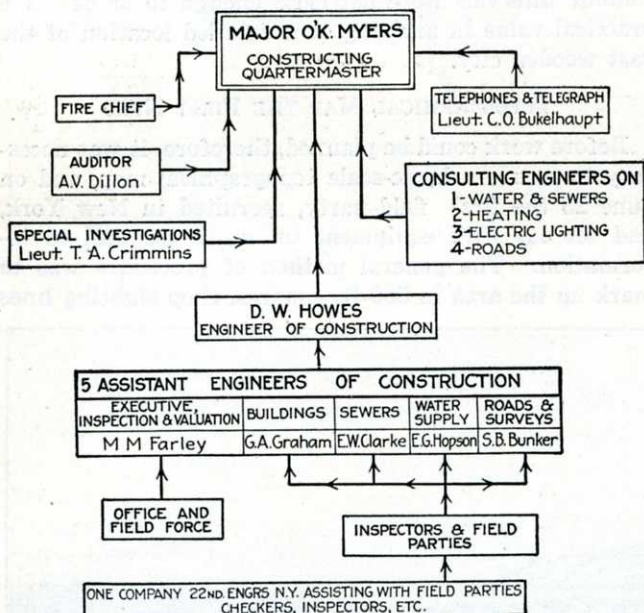
ALL HANDS RAISE THE FINISHED WALL INTO A VERTICAL POSITION—THIS SCHEME OF CONSTRUCTION ELIMINATES ALL SCAFFOLDING

through the brush along these rectangular coördinates, and take topography with transit and stadia. As a result of these operations, it was found necessary to change the tentative location of the camp which the Constructing Quartermaster had originally selected on the basis of the first small-scale map. The new location will place all buildings on areas well above ground water and will effect important savings in the delivery of sewage to the treatment works by eliminating a considerable amount of pumping.

The final location of the cantonment buildings is shown upon the accompanying plan. Owing to the flatness of the country it was possible to follow almost exactly the standard camp layout of the War Department as described in *Engineering News-Record* of July 5, page 8. The buildings will be arranged in groups to form a figure U, with legs almost 2 miles long and an open space or aisle 1000 ft. wide, running down the center. On a hill near the center of this expanse will be located the headquarters of the Commanding Officer.

TRANSPORTATION A BIG PROBLEM

There are practically no local conditions favorable to rapid construction on a large scale. All material must come in over the single-track line of the Long Island R.R. The few vehicle roads in the vicinity of the camp were merely narrow country roads, unsurfaced, and have already been deeply rutted by the unexpected volume of motor-truck traffic which they have been called upon to carry. The road between the railroad station and the camp has been widened and road hoes



THE ENGINEERING WORK AT CAMP UPTON IS DEPARTMENTALIZED UNDER FIVE MAIN DIVISIONS—ALL DIVISION HEADS HAD PREVIOUSLY WORKED TOGETHER IN THE SAME ORGANIZATION

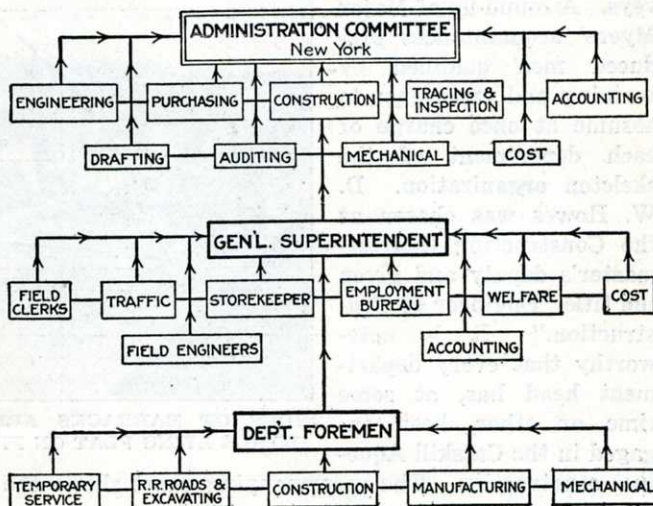
are sent over it periodically, but at the time of my visit to camp the solution of the big road problem had not advanced very far.

There is, of course, no local supply of materials or labor, and no facilities for housing the men. The plan is to billet the contractor's forces in the barrack buildings, as fast as they can be completed, but the 1600 men which the Thompson-Starrett Co. had on the job early this month were living in canvas tents.

The water-supply problem, which caused so much trouble at Camp Whitman, N. Y., when the New York militia forces were mobilized last year for service on the Mexican Border, is a comparatively simple one at Camp Upton, for wells already sunk indicate a plentiful supply of ground water of excellent quality adjacent to the camp site.

TERMS OF CONTRACT

Like all the other National Army cantonments, the Camp Upton work was let on a percentage basis. The terms of these contracts were explained in *Engineering*



HOW THE CONTRACTOR HAS ORGANIZED HIS FORCES

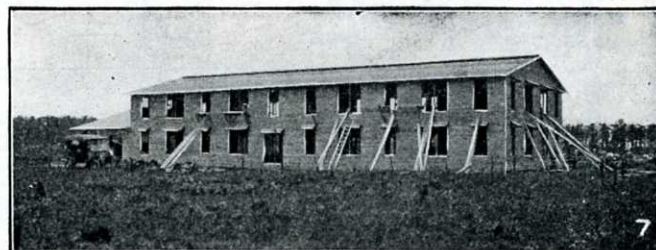
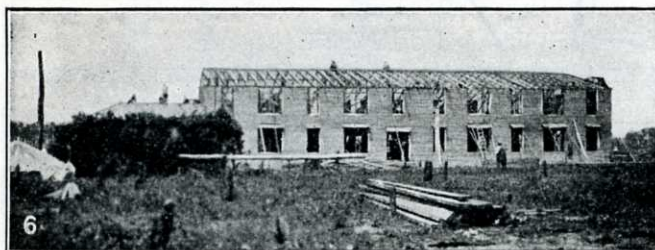
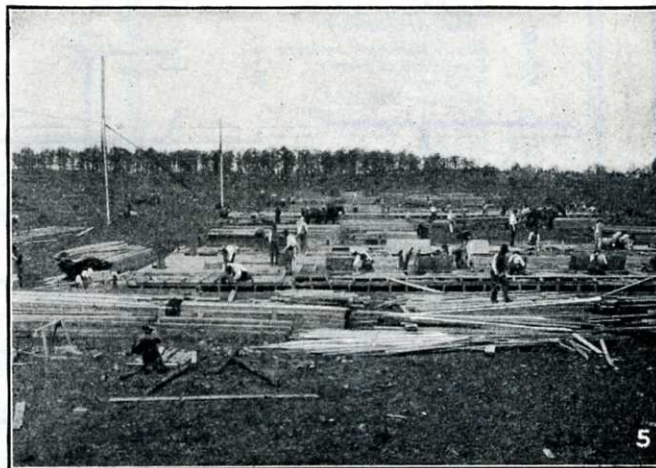
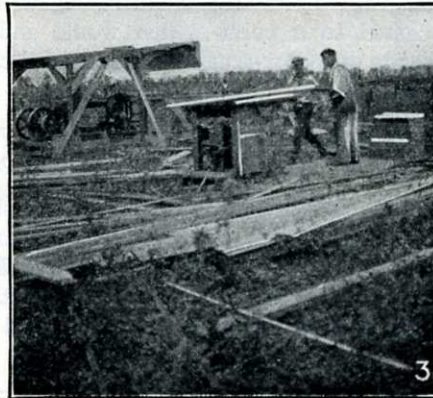
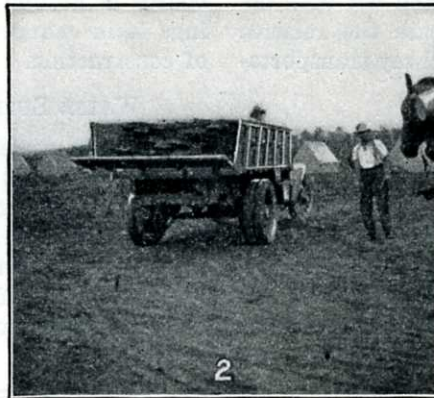
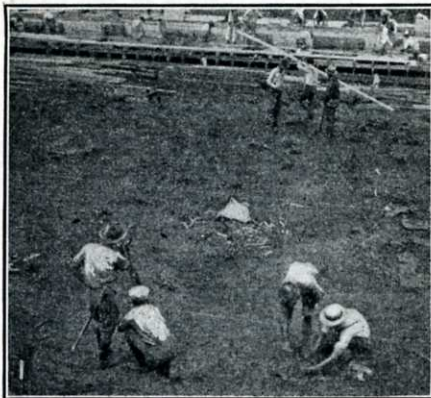
News-Record, July 5, page 43. In no case is the total percentage payment to exceed \$250,000.

The contractor is paid whenever materials are delivered and vouchers prepared and submitted to the Constructing Quartermaster. This may be daily. The idea is to take advantage of discounts. There is a monthly payment to take care of small items and to clean up the books. The Constructing Quartermaster makes the payments to the contractor, reimbursing him for the cost of the work and cost of material, plus a sum equal to 3½ per cent. on these two items. The remainder of the fee above 3½ per cent., depending on the total cost of the completed work, is withheld and will be paid upon final completion of the work.

RENTAL ALLOWANCES

Except in unavoidable cases, the practice of subletting work is prohibited, in order to prevent two profits for the same work. Each contract contains a schedule of rental rates for equipment. A few of the daily rates specified are as follows: Clamshell bucket, \$2; boiler and two-drum engine, \$3; dump wagon, 25c.; narrow-gauge locomotive, \$5; mixer, with boiler, side loader, \$4; 10-in. centrifugal pump, \$3; drop pile-driver, \$1.50; rail per ton, 6c.; steam shovel, \$30; transits, 50c.; automobiles, \$5. The Government stands all expense connected with the equipment, including freight and repairs. It is expected that the ultimate cost of the Camp Upton work will be between \$3,000,000 and \$4,000,000.

On Aug. 2 the Thompson-Starrett Co., for whom A. G. Moulton is acting as general superintendent, had about 1600 men on its payroll, although this number will be



Seven Stages in the Construction of Wooden Barracks

1. Batterboards for buildings are set accurately by survey parties. 2. Lumber is delivered to job by motortrucks. 3. Portable sawmills trim lumber as required. 4. Into these holes go the chestnut posts which serve as foundations for barracks. 5. This is the first stage of construction—putting on flooring and building sidewalks in horizontal position. 6. Sides up and roof beams in place. 7. Building complete, except for doors and windows

increased to about 12,000 when the work gets into full swing. All labor is supplied through the contracting company's special New York office on West 32nd St. The General Superintendent at the camp sends in his requisitions for labor to the New York office and the men, as fast as they can be secured, are shipped out to the job, sometimes in special cars or train.

DOUBLE CHECK ON MEN'S TIME

The system in force for keeping track of costs involves a double check on the labor force, once by representatives of the Quartermaster Department and once by the contractor. The two forces of checkers make their rounds separately, and each workman's card is punched twice daily. The labor force works one 10-hour shift a day, although at times it is necessary to employ night crews to unload material from railroad cars. Common labor is paid \$3.75 a day, 75c. of this amount being required for three meals a day at the commissary housed by a big circus tent.

BUILDING WOODEN BARRACKS

For the delivery of lumber and other materials used in the construction of the barracks buildings, there have been built two railroad sidings from the Long Island track, one for permanent camp service and the other only for the construction period. The latter extends approximately along the longitudinal axis of the huge letter U which will be formed by the completed structures, as shown in the plan. Freight cars are spotted on this siding as near the building construction as possible, and the lumber is unloaded and carried to the various points of use by motor trucks and teams. For this service a United States Army motor-truck company, consisting of about thirty Peerless trucks, is available for the contractor's use. In addition, a number of horse-drawn wagons have been provided, as well as lighter Autocar trucks. An experiment is being made in the use of industrial tracks and cars for the delivery of lumber and other supplies from the freight cars to the points of building construction, but at the time the work

was visited the transportation system had not been developed to a point which would indicate the relative merits of motor-truck and industrial-railway transportation.

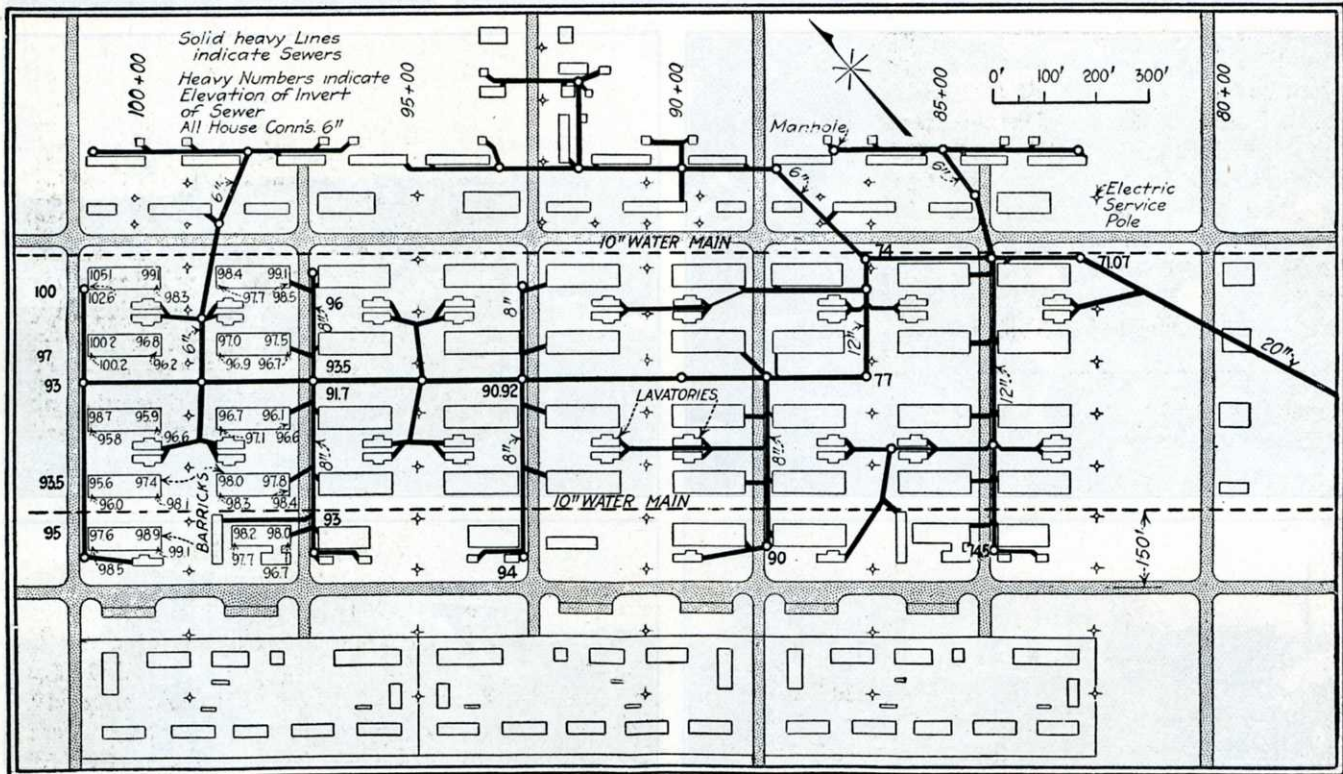
BARRACKS SIDES BUILT FLAT ON FINISHED FLOOR ARE RAISED TO VERTICAL POSITION

The standard barracks unit, two stories high, measures 140 x 43 ft. in plan, overall, and its details are shown in the drawings reproduced in *Engineering News-Record* of July 5, page 9. In constructing them, the Thompson-Starrett Co. has adopted a scheme which

boards at ground level. The construction of the buildings is in charge of G. A. Graham, assistant engineer of construction.

WATER SUPPLY THROUGH WOOD-STAVE PIPE

The camp water supply will be obtained from fifteen 8-in. driven wells located about 3 miles from the nearest camp building, as shown on the accompanying plan. Tests have indicated that each well can be counted upon for a minimum output of 150 gal. per minute. A pumping plant of three centrifugal units delivers into a 14-in. wood-stave pipeline 13,200 ft. long, extending



TYPICAL ARRANGEMENT OF VITRIFIED PIPE SEWERS FOR A THREE-REGIMENT GROUP OF BUILDINGS

eliminates the use of scaffolding. Wooden posts are sunk in holes several feet deep to carry the sills and floor joists. The next operation is the laying of the rough flooring. Upon this flooring the two sides of the structure are framed, and upon the studding, lying flat on the floor of the building, tar paper and the wooden sheathing for the sides is nailed. In other words, the sides of the building are put together, complete, in a horizontal position rather than in the vertical position which they occupy in the completed structure. When the pair of side walls is finished, snubbing lines are attached, at intervals, along the outer edge, as the wall lies flat on the flooring, workmen are lined along the inner edge every few feet and at a given signal raise the wall upward into its vertical position, where it is held by a temporary bracing until the other side wall and the end walls can be raised into place in the same way. This scheme of construction, according to the contractor's representative, is a great time saver, as it not only does away with the use of scaffolding but also secures faster work on the part of the carpenters, who are enabled to do all framing and nailing of siding

uphill to four elevated tanks of redwood, each having a capacity of 200,000 gal. The lift is about 125 feet.

Although the elevated tanks are high enough to supply most of the camp area by gravity, it was decided to increase the pressure to cover periods of maximum use and for fire-protection purposes. With this end in view, a booster station is provided below the elevated tanks.

All of the water-supply system will be distributed through wood-stave pipe, with a minimum cover of 2 ft. to provide against freezing and against crushing by heavy motor-truck loads. The trench for the pressure line uphill from the pumping station No. 1 is being dug by a Parsons trench excavator. This machine, reinforced by others, will also be used on the distribution system and on the trenches for the sewerage system. The construction of the water-supply system is in charge of E. G. Hopson, assistant engineer of construction.

SEWERAGE AND SEWAGE TREATMENT

The sewerage system is designed to handle a maximum flow of 10 cu.ft per second. It will consist of vitrified clay pipe, from 8 to 30 in. in diameter. About

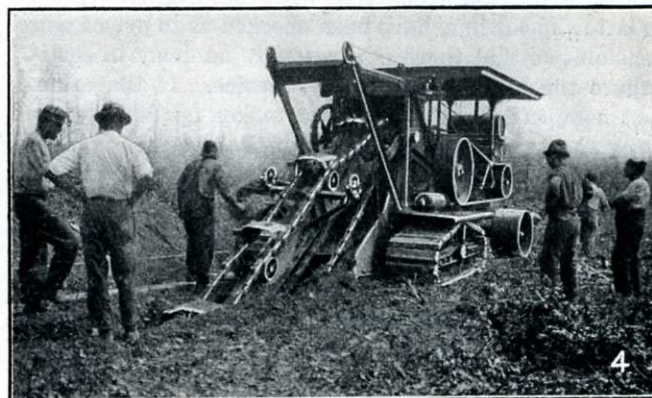
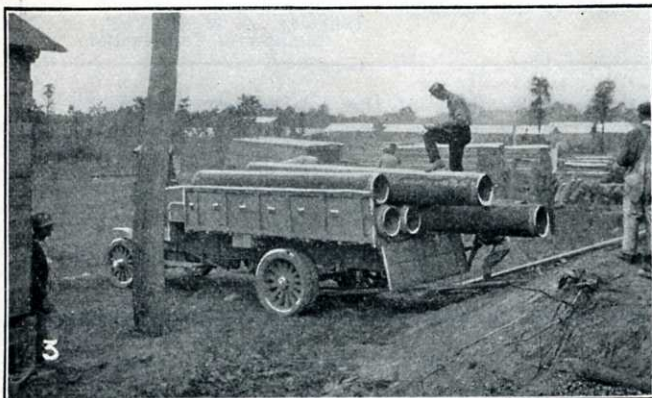
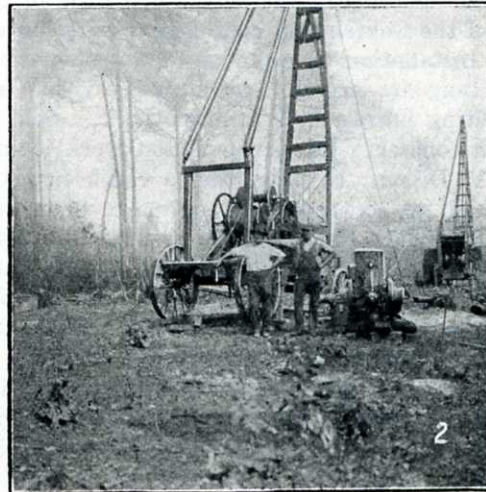
one-half of the flow will have to be pumped. The United States Army makes certain standard assumptions regarding the amount of sewage produced by military units, which is summarized in Table I. This table is based on the assumption that the maximum flow from the entire cantonment at any time will be equal to the maximum flow from one brigade plus the normal flow from all other units. Trunk and outfall sewers severally should be designed on this basis, according to War Department instructions. For example, if there are two trunk sewers, one receiving sewage from five

connecting mains 12 in. The latter deliver into a 30-in. outfall line. The buildings are so arranged that the kitchens are all on the street ends, thus allowing for economy in the use of pipe.

The pipe will be laid in trenches excavated by machine as soon as the building operations have progressed sufficiently to allow the trenching work to proceed. The pipe will be laid with cement joints and with a minimum earth cover of 2 ft. At road crossings, where heavy motor-truck loads are liable to be superimposed upon the tile pipe, the latter will be encased in shells of con-

Getting Water Supply to Camp

1. UNLOADING WOOD-STAVE PIPE
2. PUTTING DOWN 8-INCH WELLS
3. MOTOR TRANSPORT FOR PIPE DELIVERY
4. TRENCHING FOR PIPE LINE



units and the other from seven units, these trunk sewers will have respective capacities of 5.5 and 6.5 cu.ft. per sec., while the outfall sewer receiving the flow from both trunk lines should have a capacity of 9 cu.ft. per second.

TABLE I. SEWER DATA, U. S. ARMY SPECIFICATIONS

Regts. of Infantry	Flow, Cu.Ft. per Sec.	Regts. of Infantry	Flow, Cu.Ft. per Sec.
1	1.5	8	7.0
2	2.0	9	7.5
3	4.5	10	8.0
4	5.0	11	8.5
5	5.5	12	9.0
6	6.0	13	9.5
7	6.5	14	10.0

The grades at which the sewers are laid are such as to produce a velocity of 2½ ft. per sec., which is considered to be self-cleansing. The regiment of infantry is the basic unit used in army camp sewer design.

TYPICAL SEWER LAYOUT

A typical arrangement of sewers for a three-regiment group of buildings is shown in the accompanying drawing. The house connections are uniformly 6 in. in diameter, the branch lines 8 in., and in this case the

crete. An important detail of the design is that both sewer and water-supply lines are offset from the roads, so that the maintenance and repair of the subsurface structures will not block highway traffic.

The following minimum grades have been established for the sewer lines: 6-in. diameter, 0.5 per cent.; 12-in. diameter, 0.23 per cent.; 20-in. diameter, 0.14 per cent.; 30-in. diameter, 0.07 per cent.

SEWAGE TREATMENT PLANT

The disposal plant is located about one-half mile northeast of camp, and consists of duplicate covered septic tanks, each 100 x 25 ft. in plan and 8 ft. deep. These tanks are of standard design furnished by the Quartermaster Department of the army. In each tank are four hopper-bottomed pockets, from which the accumulated sludge will be discharged by gravity onto sludge-drying beds. As a matter of fact, it is expected that the plant will be called upon to deal with very small quantities of sludge, inasmuch as the bulk of the solids will be fecal matter, which will break up and decompose.

The tank effluent will be distributed by wooden troughs to thirty acres of slow-sand filter with 6- and 8-in. under-drains leading to a nearby swamp. The filter area will be divided into beds approximately 1 acre in area. The filter beds will utilize the natural layers of sand to at least a depth of 6 ft., through which the settled sewage will pass. The construction of sewerage systems and disposal works is in charge of E. W. Clarke, assistant engineer of construction.

HOW MATERIALS ARE CHECKED

The adoption of the percentage form of contract for all of the Government cantonment work has necessitated the installation on each job of a systematic method of auditing by expert accountants. There is a central auditing bureau in Washington and a field auditor for each contract; the Camp Upton work is in charge of A. V. Dillon. In order that a check on materials may be had, the contractor is required to submit three copies of all orders for materials or supplies. One of these goes to the material inspector, one to the receiving clerk, who checks the quantities, and the third to the voucher clerk for the field auditor's files. On the third copy all prices and extensions are verified.

The contractor must sort out invoices immediately on their receipt and give the right of way through clerical channels to those on which a cash discount may be had. Duplicates of invoices go to the field auditor, and are, by his staff, compared with the original orders. The latter, meantime, have been checked as to prices and extensions, so that there is practically no delay in certifying to the correctness of any invoice. If the order is not complete, the field auditor makes up dummy receiving sheets, and when enough of these dummies have been made to account for the entire order, the bills are O. K.'d.

When the contractor accumulates twenty or more invoices he makes up a voucher sheet and presents it for reimbursement, having already paid the sums represented by the various invoices.

At the end of each month the contractor submits a statement of labor and materials, which is checked from the field auditor's records. Payment includes the balance due plus $3\frac{1}{2}$ per cent. on all money paid to the contractor during the month. The remainder of the percentage fee due the contractor is retained until the work is completed.

When a piece of heavy machinery is received on the job it is immediately evaluated by representatives of the Constructing Quartermaster and a rental value fixed. If the rental paid at any time shall equal the total valuation of the machine, further rental stops and the machine becomes the property of the Government. Another contract stipulation is that the Government may take over any machine by paying the difference between its assessed valuation and the rent already paid.

ROADS

A separate contract for road construction within and adjacent to the camp site was let to the Barrett Co. The camp site will be served by systems of primary and secondary roads, each of 34-ft. width. These roads, of which the primary system includes eight miles and the secondary system twelve miles, will be tar-surfaced by

the penetration method. It will be necessary to import all stone, as no local supply is available. Practically no drainage troubles are anticipated, as the Long Island soil is sandy and surface water will seep through it readily. All roads, however, will be built above the normal ground level, with water mains and sewers at the sides. It is expected that these roads, when the site becomes an army training camp, will be subjected to exceedingly heavy motor-truck traffic, and a maintenance force will be kept on the work continuously. The road work is being handled for the Quartermaster Department by S. B. Bunker.

A NEW KIND OF "GOVERNMENT JOB"

By the time this article appears, building construction, which had hardly got under way early this month, will be in full swing. The fact that 25,000,000 ft. of lumber will be used for the barracks, storehouses, and other structures, and that a complete water-supply system, sewerage system, and disposal works, and a network of bituminous-surfaced roads, are required, gives one some idea of the task which the engineers and contractors are facing. The man who has always regarded "Government jobs" as sinecures gets a rude shock when this sign confronts him on the door of the engineer's shack:

MEMORANDUM
Office hours of this organization are as follows:
8 a.m. to 6 p.m.
Field parties are expected to be out in the field during these hours. Inspectors' hours in the field are to correspond to the contractor's working hours.
(Signed) D. W. HOWES,
Engineer of Construction.

In the early days of the job, a new draftsman approached M. M. Farley, assistant engineer in charge of all field-office work:

"What style of lettering do you want on this drawing?" he asked.

"Anything that I can read and that you can do the quickest," Farley replied.

And there you have the spirit of the Camp Upton job.

No Refinements on War-Zone Roads

The refinements of road building receive scanty attention along the battle line in France. In the early days attempts were made to use telford foundations in damp places, where suitable stone could be obtained. The stones were set on edge and wedged with small stones. In ordinary times such a foundation is then consolidated by running a roller over it. But behind the trenches no roller could be used. It would rarely have been possible to get it there and it would have been too much in the way of guns and ammunition wagons to be allowed there in the rush of a forward movement. So instead of a roller with broad wheels, the much narrower wheels of heavy gun carriages and limbers were dragged over the stones and hammered them down into the mud. Had it been possible to cover the stones immediately with broken bricks or building refuse the foundation might have proved satisfactory, but under the existing conditions it was a hopeless failure. So instead of wedging the stones upright, the army road builders finally laid them flat. The traffic shook these flat stones down quickly—more being placed on top.